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IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA
IN AND FOR THE COUNTY OF SAN FRANCISCO
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ROGER WRIGHT and THAIS WRIGHT,
Plaintiffs,
vs. No. 966580
ABEX CORPORATION, et al.,
Defendants.
_____/

DEPOSITION OF
FREDERICK R. POOLEY, PH.D.
Wednesday, August 2, 1995

REPORTED BY:
HOLLY THUMAN, CSR NO. 6834, RPR

TOOKER & ANTZ
CERTIFIED SHORTHAND REPORTERS 131 STEUART STREET, SUITE 201
SAN FRANCISCO, CALIFORNIA 94105

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EXAMINATION BY: PAGE

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BE IT REMEMBERED that on Wednesday, August 2, 1995 commencing at 2:00 p.m., thereof, at Internews, 3220 Sacramento Street, San Francisco, California, before me, HOLLY THUMAN, duly authorized to administer oaths pursuant to Section 2093(b) of the California Code of Civil Procedure, appeared via teleconference from the Cardiff

International Arena, World Trade Center, Cardiff, Wales, United Kingdom,

FREDERICK R. POOLEY,

called as a witness, who, having been first duly sworn, was examined and testified as hereinafter set forth.

APPEARANCES

BRAYTON, GISVOLD & HARLEY, 999 Grant Avenue, Novato, California 94948, represented by PHILIP HARLEY and GREGORY M. SHEFFER, Attorneys at Law, appeared as counsel on behalf of the Plaintiffs.

SHOOK, HARDY & BACON, One Kansas City Place, 1200 Main Street, Kansas City, Missouri 64105, represented by WILLIAM S. OHLEMEYER, Attorney at Law, appeared as counsel on behalf of Defendant Lorillard.

PREUSS, WALKER & SHANAGHER, 595 Market Street, 16th Floor, San Francisco, California 94105, represented by DONALD F. ZIMMER, JR., Attorney at Law, appeared as counsel on behalf of Defendant Hollingsworth & Vose Co.

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(Appearances, cont'd)

NUTTER, McCLENNEN & FISH, One International Place, Boston, Massachusetts 02110-2699, represented by ANDREW J. McELANEY, JR., appeared as counsel on behalf of Defendant Hollingsworth & Vose Co.

Also present was PAM DUMA with Shook, Hardy & Bacon.

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August 2, 1995 2:00 p.m.

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EXAMINATION BY MR. OHLEMEYER

MR. OHLEMEYER: Q. Dr. Pooley, why don't you give us your full name for the record.

A. Frederick David Pooley, P-o-o-l-e-y.

Q. And Dr. Pooley, you are, as we speak, in Cardiff, Wales. Is that right?

A. Yes.

Q. And you had planned to join us in San Francisco for the Wright trial, but some scheduling problems prevent that.

A. That's correct, yes.

Q. Tell us what your occupation is.

A. I am a professor in the School of Engineering here in the University of Wales at Cardiff. The --

Q. How long -- go ahead.

A. I'm head of the Division of Materials and Metals, with responsibility for directing an environmental engineering degree stream and for research in the environmental field.
Q. How long have you been so employed?
A. I've been employed by the university for 30 years, and I've been a professor for 10 of those 30 years.

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Q. And during that time, have you developed a specialty?
A. My specialty in research relates to the study of fine mineral particles, with special reference to their biological potential and characterization and separation and recovery.
Q. And when you say fine mineral particles, does that include asbestos?
A. Yes.
Q. And what do you mean by biological potential?
A. Well, a large portion of our -- my research in this fine mineral particle field, the dust field as it's quite often referred to, is concerned with investigating the biological potential, the disease potential, of fine mineral dusts, especially when they are inhaled from the atmosphere.
Q. Okay. Describe for us, Dr. Pooley, your educational background.
A. Well, initially I went to grammar school in London until the age of 18.
I then proceeded via what we call an apprenticeship scheme here in Great Britain to university, where I obtained an honors degree in mining engineering in 1963.
In 1964, I then obtained a Master's degree in minerals engineering; and in 1966, a Ph.D. in minerals

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engineering.
And since that time, 1966, when I obtained my Ph.D., I've been employed in the university here in Cardiff.
Q. In connection with your education or your profession, have you developed experience with the use of electron microscopy?
A. Yes. From in fact my early research days while studying for a Ph.D., I first became involved in what was at that time the infancy of electron microscopy and have been involved with it ever since.
Q. And is that something that you use on a regular basis in your profession?
A. Every day.
Q. Do you have any experience in the analysis of lung tissue for the presence of asbestos?
A. Yes. Yes, extensive experience.
Q. Would you describe that for us, please?
A. Well, my -- I mentioned that I've been involved in electron microscopy ever since my first studies at Ph.D. level.
And in fact, at that time I became involved with the research group here in Cardiff, the Medical Research Council research group, and became, as it were, a research associate and a consultant and a research fellow with the Medical Research Council, particularly in that particular

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field, studying asbestos mineral particles.
Q. Is that a government-sponsored organization?
A. Yes. The Medical Research Council is the, as it

were, medical research arm of the government.
Q. And why is lung tissue analyzed for the presence or the quantity of asbestos?
A. Well, one of the main objectives in examining lung tissue for asbestos, and any other mineral particles, is to try and establish the relationship between the amount of material that's inhaled and retained in the lung and the progression of any subsequent dust-related disease.
Q. And how is that analysis undertaken?
A. Well, essentially, we work very closely with the medical school here in Cardiff. And in conjunction with them, they obtain postmortem materials or biopsy materials, and we examine them to establish their mineral content.
And that information can then be combined together with the pathological studies -- for example, fibrosis or cancer. And from the study of large numbers of cases, we can get a very good idea of what levels of dust are causing what types of diseases.
Q. Is that an area that you've also done some original research in?
A. Oh, well, all the work we do is original research.
Q. And have the results of that research been

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published in what have been described already as peer-reviewed journals?
A. Yes. There are many publications with which I have been involved.
Q. I'll ask you in a moment about a publication specifically, Doctor.
But let me ask you, with respect to the fiber burden analysis, can you give me some kind of estimate as to how many lungs, or cases, as you use the word "case" in your profession, you've been involved in as it relates to fiber burden?
A. Well, at the present time, we've probably received in the order of 20 to 30 cases or samples of lung per week.
So if you multiply that by 52, you get some idea. We're talking about between 1- and 2,000 specimens a year.
Q. And for how many years have you been involved in this?
A. Well, since 1966.
Q. And how many of those cases, on average, involve mesothelioma?
A. Oh, over that time period, a very large number. I would say approximately 15, 20 percent of the asbestos-related cases.
Q. Can you give me any idea what percentage of the total number of mesothelioma cases in Great Britain that

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that represents?
A. Well, on average, we -- the number has increased this year. But on average, I would say we see between 20 to 50 percent, a figure somewhere in that region.
Q. And that's 20 to 50 percent of the cases of mesothelioma that occur in Great Britain?
A. Yes.
Q. Do you belong to any -- do you belong to any professional organizations that relate to your specialty?
A. Well, I am a member of many, as it were, professional societies.
For example, I'm a fellow of the Institution of Mining Mortality; a member of the American Institute of Mining Engineers; a fellow of the Minerals Engineering

Society; and a member of Institute of Water and Environmental Management. I'm also a Chartered Engineer here in Great Britain.

Q. And how do you qualify for those organizations and those memberships?

A. Essentially, by obtaining the correct academic qualifications with the appropriate degrees in the subject areas appropriate for those associations. And also, by demonstrating that you have obtained the necessary professional experience, either practical or research experience, in the field.

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Q. Have you acted as a consultant to the British government in the area of asbestos and disease?

A. Well, the -- as I mentioned earlier, it was in 1966 when I started work with the Medical Research Council. And in fact, I became what is called a Medical Research Council Research Fellow for a number of years. And in fact, I was actually paid -- although I was employed by the university, I was paid by the Medical Research Council.

And they supported our research in Cardiff up until about 1985. And the responsibility then for funding transferred to what is called over here the Health and Safety Executive, which is a government body responsible for research into health and safety matters in the occupational environment.

And they are funding us now. So we've been continually funded by government from the period 1966.

Q. Do you know what the World Health Organization is, Doctor?

A. Yes.

Q. Tell us what the World Health Organization is.

A. Well, it's an organization which has been set up to, as it were, advise and oversee the health of nations at large.

An arm of the United Nations, as it were.

Q. Have you been a consultant to the World Health

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Organization on the biological effects of mineral dusts, including asbestos, and their collection and quantification?

A. Yes, I have.

Q. Would you describe that for us?

A. I will. Well, we've been funded in several studies by the World Health Organization. One of their -- one of the branches of their organization is known as the International Agency for Research on Cancer, which is based in Lyons, in France.

And we've undertaken several studies in conjunction with that organization, both here in Great Britain and abroad in countries like Turkey and Cyprus.

Q. You mentioned earlier that you published some information in the scientific literature in this field.

Could you describe generally for us the types of publications and the subject matters on which you've published?

A. Well, they can be divided into various groups. There are articles which relate to techniques and instrumentation and methods for examining fine mineral particles, including asbestos.

There are articles which relate to the physical characteristics of airborne and respirable asbestos particles and other mineral particles.

And there are articles which relate to studies

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where we have looked at the exposure of particular occupational groups to mineral dust to establish their exposures, and also compared those exposures with what we call control populations.

Q. And have you collaborated on those publications with other researchers in your field?

A. Oh, yes. When undertaking studies concerned with the exposure of occupational groups or control groups to dusts, including fibers, there are normally several inputs to those sort of studies.

For example, there's the epidemiologist, who establishes the history of the exposure; there are pathologists who collect materials and study the anatomy of the disease which the individuals might have suffered with.

And of course, there are ourselves, who supply, as it were, the basic information relating to the dust and the particles which we locate in tissues, and the concentrations that they're in tissues, which were perhaps the cause of the illnesses which they obtain.

Q. There's been some reference already in this case to a Dr. Wagner, or Dr. Wagner, depending on how you pronounce his name.

Have you and Dr. Wagner collaborated on studies that have been published in the literature?

A. Yes. Since 1966, yes.

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Q. And Dr. Pooley, have you also served as a court-appointed expert on matters relating to fine mineral particles and/or asbestos?

A. Yes. We -- here in Great Britain, we -- because we're a rather unique laboratory in the country -- we're the only ones, if you like, to be considered to be full-time investigators in this particular field in Great Britain, we serve -- we serve the courts here by supplying them with information relating to disease cases where the cause of death is likely to have been exposure to a mineral dust.

And I've also acted as a court's witness in the United States as well, in a case in Minneapolis.

Q. And what type of case was that?

A. Well, that was a pollution case, where a company was polluting Lake Superior. And there was some cause for concern for the health of the people who were living on the north shore of that lake, because they drew their water from the lake.

And so I actually provided information directly to the Court on matters relating to the fibers -- fibrous particulates that were in the water, fibrous particulates that were in the air in that area, and also fibrous particulates that were in the tissues of people who had died that lived locally in that area.

Q. In identifying or describing fibrous particulate

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matter in air or in water or in tissue, are you able, using certain techniques, to determine what type of mineral particle you are seeing or you're dealing with?

A. Yes. The techniques now available allow us to identify with great accuracy the individual mineral particles, yes.

Q. And explain for me what you mean by individual mineral particles.

A. Well, we can prepare samples of dust, whether they're from air, water or tissue. We can insert them into

microscopes that we now have available, and we can see every particle, because the magnifications we're now able to obtain are very high, so we can see the smallest particles.

We're able to size those particles very accurately. We're able to examine the chemistry of those particles and obtain fairly accurate chemistry from individual dust particles. And we're also able to look at the structure of the particles, if they're crystalline, to confirm and identify the particles very accurately.

Q. And when you talk about the chemical structure, does that allow you to differentiate, for example, one type of asbestos from another type of asbestos, or asbestos from another type of fibrous mineral?

A. Yes. It allows us to do that very accurately.

Q. And is there a technique known as x-ray

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diffraction that allows you to do that?

A. Yes. X-ray diffraction allows you to do that, but you need a very large number of particles in order to obtain information from x-ray diffractometry.

Using an analytical transmission electron microscope, for example, you can obtain information from a single dust particle.

Q. Let's back up for a minute, and let me ask you how you got involved in the study of asbestos, and how you developed your expertise in this area.

A. Well, as I mentioned, part of my research for my Ph.D., I was involved in using an electron microscope to characterize fine mineral particles.

The fine mineral particles I was looking at in 1964 and 1965 were in fact mixtures of coal and other minerals associated with coal, coal dust.

And at that time, Dr. Wagner -- he arrived in Great Britain from South Africa in approximately 1961, and he was working at the Medical Research Council Research Unit in Cardiff.

And when he found that we had an electron microscope, we were able to examine fine asbestos particles, he then brought samples along, and I became involved in joint research with him.

And the first problem that we tackled was, in

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fact, trying to distinguish between fibrous particles of the different asbestos minerals.

Q. And let me ask you, Dr. Pooley, is there a level of asbestos that is naturally occurring in air and in water?

A. Yes, there probably is. But of course, all of man's activity, industrial activity and his normal day social activity, adds extra asbestos, as it were, to the ambient air that we breathe.

Q. I guess my --

A. And -- sorry.

Q. I interrupted you.

I guess what I should have asked is, is there a level of asbestos that is normally present, as opposed to naturally occurring?

Is there a level of asbestos that is normally present in the air we breathe and the water we drink?

A. Well, you can walk out into San Francisco, for example, and take air samples, and you would find asbestos fibers in those air samples, I'm sure.

The levels would obviously differ from location to location. And, for example, the levels would obviously be

related to the type of industries that are local to particular towns or districts.

And so, for example, if you lived closer to an asbestos mine, you would expect to see higher levels of

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asbestos particles which would have emanated from the mining operations at that mine.

Q. Is this level -- go ahead.

A. Sorry.

Q. No, go right ahead.

A. I said, normally, in the western industrialized world, there are virtually no locations where you can say you would have a clean air sample.

Q. And would these air samples include different types of asbestos fibers, including crocidolite asbestos?

A. The -- yes, there would be a range of asbestos fiber types. The main mineral would of course be chrysotile, because that is the most commonly used material.

And yes, you would find crocidolite fibers in certain locations, especially where there had been use of that mineral in industry, or in products that had been used in building, for example, in towns and in cities.

Q. Have you actually been involved in research projects that attempted to measure the level of asbestos present in the air and try to characterize what types of asbestos fibers could be found?

A. Yes. We have been involved in it.

Q. And have those studies demonstrated the presence of all types of asbestos fibers in the background, as it were?

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MR. HARLEY: Objection. Vague, overbroad. Location is not definite.

MR. OHLEMEYER: Q. Let me rephrase the question, Dr. Pooley.

Have you done studies -- have you been involved in studies in the United States which have demonstrated the presence of crocidolite asbestos fibers in the background?

A. Well, the -- not directly taking air samples in the United States, no.

But of course, the -- we have been involved in studies where we have examined lung tissue specimens of disease cases, and also control cases in the United States. And of course, the lung is perhaps one of the best natural dust samples.

So detecting particulates in the lung is a good indication that those particulates were there in the environment of the individuals that we sampled.

Q. Have other researchers in North America conducted studies that demonstrate the presence of crocidolite asbestos in the background?

A. Yes.

Q. And have those studies been published in the scientific literature?

A. Yes. There's one I can bring to mind, and that is the study by Churg and Warnock of people in San Francisco.

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Q. Now, a few moments ago, Doctor, you said something about the physical characteristics of asbestos.

What is it about the physical characteristics of asbestos that relate to its ability to cause disease?

A. Well, the most important physical characteristic of asbestos is the fact that it forms fibrous particles. If

it didn't form fibrous particles, it would have virtually very little disease potential as we know it now.

Q. Okay. And tell me what you -- or define for us what a fibrous particle is.

A. Well, there are many definitions of fibers. But for research purposes, we consider fibers to be particles which have a 3-to-1 actual ratio.

Q. And that means they have to be three times longer than they are wide?

A. That's right, yes.

Q. With respect to asbestos, is there evidence to suggest that an asbestos fiber needs to be a certain size or a certain shape to create the potential to cause disease?

A. There is, yes, very good evidence in the literature now to suggest that the longer the fiber becomes, the greater the disease potential it has.

Q. Is there a limit to the length or the width of an asbestos fiber as it relates to its ability to cause disease?

A. Well, the -- normal particles are inhalable and

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respirable. There is a limit to the length of fiber, as it were, that you can get into the lung.

There are fibers up to 100 microns that have been recorded in lungs. But normally, the top size of asbestos fiber would be approximately 40 to 50 microns in length.

And this length is very, very important, because, if you like, they are -- long, thin particles are very unnatural particles. Asbestos is a very rare material. And so when these long fibers get into the lung, the longer they are, the harder it is to get them out, essentially.

And so the lengths of the fiber imparts to the fiber the ability to lodge itself in the tissues and stay there and cause a problem.

The shorter the particle becomes, the more readily it can be dispersed and dealt with by the natural biological mechanism of dust removal.

Q. Explain for us the concept of respirability; what you mean when you refer to a respirable fiber.

A. Well, it's now well understood that if you are exposed to a dust cloud, the only particles that are likely to access your -- the gas exchange regions of the lung, the alveolar spaces, as they're called, are particles which are sufficiently small enough to stay in suspension to reach those locations.

If particles are larger than what are called

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respirable, then they will tend to settle out in the airways before reaching the alveoli. And if they are very large, they will settle out in the nose and the mouth before actually starting to descend the trachea into the lungs.

And so we're able to, as it were, describe particles on the basis of their ability to reach these alveolar regions.

And that's what this "respirable" term refers to: The size of particles which are capable of reaching the alveolar spaces, the gas exchange regions of the lung.

Q. And as it relates to mesothelioma, Dr. Pooley, is that a prerequisite to asbestos's ability to cause disease?

A. Yes. Because if the particles are larger than respirable size, then as I said, they will be trapped and settle out higher up the respiratory system and be cleared very efficiently by the natural sort of clearance mechanism that we all have in our lungs.

Q. Now, are structures or aggregates of asbestos fibers respirable?
MR. HARLEY: Objection. Lacks foundation as to what's meant by the term.
MR. OHLEMEYER: Q. Let me back up, Dr. Pooley.
Of are you familiar with -- is asbestos described as -- are words like "structure" and "aggregate" and "bundle" used to describe asbestos?

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A. Yes. You can sometimes find asbestos not occurring as single fibers, but as aggregates of fibers, as it were, bundles of wooly type particles.
Q. And when asbestos is found in that form, is it respirable?
MR. HARLEY: Objection. What is that form?
MR. OHLEMEYER: Q. Are bundles or aggregates of asbestos fibers respirable?
MR. HARLEY: What is a bundle or an aggregate?
Objection. Vague as to the term.
MR. OHLEMEYER: Q. Okay. Doctor, I thought you just defined for us what an aggregate or a bundle of asbestos fibers are.
Would you define for me what a bundle or an aggregate of asbestos fibers are?
A. Well, if you were to observe an aggregate or a bundle, you would see a fine mesh of interwoven fibrous particles.
Q. In that form, is asbestos respirable?
A. No, it's not.
Q. Why not?
A. Well, because of the interwoven shape and size of these objects, they tend to be trapped in the upper respiratory system, and in the trachea, and in the bifurcations of the bronchioles before they penetrate into

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the gas exchange regions of the lung.
Q. Does an asbestos -- does a respirable asbestos fiber have to be a certain length before it can create a risk of causing mesothelioma?
A. Well, as I mentioned, the disease potential of asbestos fibers is length-related.
The longer the fiber becomes, if it's respirable, if it's respired, inhaled, then the greater the probability that that fiber will be retained in tissues to do damage, as it were.
The shorter the fiber, the less likely -- the shorter the residence time, and the more rapidly that particle will be cleared.
So when fibers become shorter than, say, 5 microns, they begin to behave like any other 5-micron-sized dust particle, and can be cleared very efficiently by the natural clearance mechanisms in the lung.
Q. And Doctor, are there regulatory standards that deal with exposure to mineral particles, including asbestos, in the workplace?
A. Yes, there are, yes.
Q. And do those standards differentiate between fibers greater than 5 microns in length as opposed to fibers smaller than 5 microns in length?
A. Yes, I believe they -- the standards refer to

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fibers longer than 5 microns in length, yes.
Q. What else, if anything, affects the respirable

potential or respirability of an asbestos fiber?
A. Could you repeat that question, please? I'm not quite sure what you --
Q. Well, aside from the length or the width of an asbestos fiber, is there anything else that can affect its ability to find its way to the gas exchange regions of the lung?
A. Oh, yes. If it's -- let's say, it's associated with any other material.
For example, it could be coated with material, for example. And that would impart to it -- it would give it a larger size, as it were.
Q. And would that larger size decrease the likelihood that it would find its way to the gas exchange regions of the lung?
A. Yes. It would behave as a larger particle.
Q. Have you conducted research into the size and shape of asbestos particles as it relates to its ability to cause disease?
A. Yes. We have published, in fact, several papers related to the size, size characteristics, size distributions, length and diameter distributions of asbestos fibers that are retained in lung tissue and are responsible

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for the biological effect.
Q. Now, Dr. Pooley, at my request, have you reviewed some materials relating to Kent cigarettes that were manufactured and sold with asbestos-containing filter material?
A. Yes, I have.
Q. Specifically, have you reviewed correspondence and documents from Lorillard's files relating to work done in the 1950s and efforts made to analyze the smoke from those cigarettes?
A. Yes, I have.
Q. Have you reviewed the patents relating to the filter material and the method of manufacturing that filter?
A. Yes, I have.
Q. Have you reviewed articles that appeared in the Journal of the American Medical Association during the 1950s that describe the use of asbestos-containing filter material in those cigarettes?
A. Yes, I have.
Q. Have you reviewed testimony from a man by the name of Douglas Halgrin?
A. Yes, I have.
MR. HARLEY: Objection. Vague. Which testimony?
MR. OHLEMEYER: Q. Am I correct, Dr. Pooley, that you've reviewed two depositions that Mr. Halgrin gave on the

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subject of work the Fullam Laboratories did in the 1950s for Lorillard?
A. Yes, I have.
Q. And have you reviewed the photomicrographs that Mr. Halgrin believes were associated with that work?
A. Yes. I've seen the photomicrographs and diffraction patterns that were taken at that time, yes.
Q. And what is a photomicrograph?
A. Essentially, it's a picture of an object taken in an electron microscope.
It's really what you might call a shadow picture, but it would show up the shape and physical dimensions of objects placed in an electron beam, and these can be taken

at a range of magnifications.
Q. And what is a diffraction pattern?
A. A diffraction pattern is something that's obtained from a crystalline material in an electron microscope when the beam of electrons is focused down onto the particle, and the electrons are then scattered in an orderly manner in a pattern which is dependent upon the physical structure of the crystalline material.
Q. And what does that -- what does a diffraction pattern tell you about the material that you are observing in the microscope?
A. Well, normally these diffraction patterns are

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fairly unique to particular crystalline materials. And so by examining the patterns, one is able to, with some certainty, identify the crystalline phase that you're examining with the electron diffraction beam.
Q. And the crystalline phase helps you distinguish, or identify, what it is you're looking at?
A. Yes. It will tell you, for example, that, taking the asbestos minerals as an example, the diffraction pattern you obtain from a chrysotile fiber would be very different and distinctive from that obtained from a crocidolite or amosite fiber.
Q. And finally, Dr. Pooley, have you also reviewed a report generated by a Dr. William Longo, the videotape raw data and photographs associated with that report and testimony --
A. Yes.
Q. -- and deposition testimony of Dr. Longo about that experiment?
A. Yes.
Q. And that includes the experiment that Dr. Longo did with a syringe?
A. Yes.
Q. And does that include the experiment that Dr. Longo did with a smoking machine?
A. That's correct, yes.

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Q. Dr. Pooley, based upon the material that you have reviewed, based upon your background, your education and your experience as you've previously described it to us, do you have an opinion that you can state within a reasonable degree of scientific certainty as to whether people who smoked Kent cigarettes with asbestos-containing filter material during the 1950s were likely to have been exposed to respirable asbestos fibers?
A. Yes, I have an opinion.
Q. And what is that opinion?
A. My opinion from the review of all the documents that you've mentioned is that, as yet, there is no substantial information which would indicate that fibers of a respirable size were released from Kent cigarettes when and if they were smoked.
Q. And you're familiar with Dr. Longo's experiment?
A. Yes.
Q. Does Dr. Longo's experiment establish any such evidence of the release of respirable asbestos fibers?
A. No. But because of what I would call deficiencies in the study, they -- those studies do not demonstrate the release of respirable fibers.
Q. Would you explain for us or describe for us the deficiencies in that study as you've described it?

A. Well, you mentioned two studies, in fact.

There was an initial study, where Dr. Longo utilized a technique, which I think he has published, which employed the use of a syringe to simulate smoking.

And my criticisms of that particular piece of work in which he attempted to collect particles by two different techniques, which I think he referred to a direct technique and an indirect technique -- but he only in fact utilizes the indirect information that he's collected.

The deficiencies there were that he pulled a volume of air through a cigarette which he had previously lit, and then removed the cigarette from the syringe that he used, washed out the contents, and then refiltered those contents to examine them to see if he had any asbestos material. And he did find some asbestos material.

But the problem with that study was that he was washing out the contents of a syringe; then he was treating that by ultrasonication and pulling it down onto a filter, so that whatever he had collected in the syringe had been materially altered before he finally examined it in the electron microscope.

And so he was unable, as it were, to backtrack and to actually say what the initial particles released from the cigarette might have been, what shape or form they might have been.

Q. What other specific criticisms do you have of the initial study, initial experiment?

A. Well, I thought that the use of a medical syringe, drilling out the syringe, and the way that the rather old, 40-year-old cigarettes were manipulated in fact was conducive to the mechanical release of material from the filter.

And also, another criticism would be, it would be extremely difficult, by hand, using syringe, to simulate the puff or the smoking of a cigarette.

Q. You've watched the videotape that Dr. Longo prepared?

A. Yes.

Q. What do you mean by the mechanical manipulation, or mechanical release?

A. Well, the fact that the cigarette had to be squeezed and manipulated into the drilled-out neck of a plastic syringe.

Q. In your opinion, Doctor, could that manipulation have accounted for each and every asbestos structure that Dr. Longo claims to have observed in the syringe?

A. There is a possibility that they could have, yes.

Q. And in your opinion, Dr. Pooley, would the manipulation or the alteration of the material in the syringe, as you have described it, have an effect on the amount or individual numbers of asbestos structures observed in the experiment?

A. Yes. And I think that in fact is well illustrated by the results of his second experiment.

Q. Before I ask you about the second experiment, let me ask you a couple of other questions about the first experiment.

Have you reviewed the data that Dr. Longo and his organization generated in connection with that first experiment?

A. Yes. The energy dispersive x-ray spectra and the counting sheets, yes.
Q. And do those counting sheets actually describe the length or width of the asbestos structures observed in Dr. Longo's experiment?
A. That's correct, yes.
Q. Having reviewed that data, do you have an opinion, Dr. Pooley, as to whether the experiment provides any evidence of the release of single respirable asbestos fibers of a length and of a width capable of causing disease?
A. Well, as I've just mentioned, the results that he obtained in those counts were obtained from particles that had been dispersed in water after washing them out of a syringe. They are, therefore, obviously artificial.
Q. Is there any way, or is there any way to -- let me rephrase my question.

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Did Dr. Longo's experiment produce any evidence from which you could make any reasonably certain conclusions about the size and the shape of the particles as they would have occurred, if at all, in the actual smoke from those cigarettes?
A. No, none at all.
Q. And why is that, briefly?
A. As I mentioned before, because they were washed out of a syringe, the material was washed out of a syringe, dispersed to form a range of particulates, and collected on a filter, and then counted.
Q. Was any effort made in Dr. Longo's first experiment to determine whether the structures observed in the syringes resulted from the mechanical forces required to insert the cigarettes into the syringe?
A. Yes, I think that looking at the results, there is some indication there because of the wide spread of the results that he obtained.

I haven't got the report in front of me, but I know that the -- he had results varying from zero release to very large numbers of structures counted.

And that's an indication to me, anyway, that there's something wrong with the fact or the claim that fibers will be released, you know, when smoking the cigarette.

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Q. Now, you've also had an opportunity to review the data and report Dr. Longo generated in connection with a subsequent experiment. Is that right?
A. Yes.
Q. And what if anything did the results of that experiment suggest to you about the likelihood that people who smoked Kent cigarettes during the 1950s would have been exposed to respirable asbestos fibers?
A. Again, I have similar criticisms to the first experiment that he performed, although I must admit that the smoking of the cigarettes was much more scientific. And obviously, the whole cigarette was smoked, rather than just two single puffs in a syringe.

But again, the -- where that particular experimentation again fell down is that -- the particles were collected on a filter; I thought that was quite correct.

But again, the particles, once they had been collected, were in fact removed from the filter by a machine and dispersed in water before refiltration and examination.

And again, that immediately implies that there would have been some changes introduced into the physical characteristics of those particulates induced by the ashing and the dispersion of the particles.

And it would have been far better if Dr. Longo had

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looked at those particles directly on the filter, and that would have given him a much better indication of what had been drawn from the filter on the cigarettes.

Q. When you say directly on the filter, you're referring to the filter through which he drew the smoke in the machine?

A. That's correct.

Q. Are the --

A. Dr. Longo mentioned in his report, in fact, that he took great care to examine the particulates. And he adopted what might be called standard Environmental Protection Agency protocols for that examination.

And those identifications include the use of an electron microscope and the analysis of the particulates to establish their identity.

But what he failed to do was adopt the initial part of the Environmental Protection Agency's protocol. And that relates to the handling and the preparation of airborne samples for analysis on filters directly.

(Recess from 2:50 p.m. to 2:55 p.m.)

MR. OHLEMEYER: Q. Dr. Pooley, are there established and published protocols that can be used to examine inorganic material, such as asbestos fibers, that is found in material that also contains organic material?

A. Yes.

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Q. And do those protocols allow or require the procedure that Dr. Longo used that resuspended and agitated the material?

A. No.

Q. So essentially, one of your criticisms of the second experiment is that the established protocol for observing inorganic material in a sample that contains organic material was not followed.

A. Yes.

Q. Let me ask you a few questions about the Fullam Laboratory and the information that you've reviewed.

Is there any evidence in either Mr. Halgrin's testimony or the Fullam photomicrographs or the documents pertaining to the Fullam Laboratory that you've reviewed that suggest the release of respirable asbestos fibers into the smoke of Kent cigarettes?

A. No, none at all.

Q. Does that information, the Fullam information, actually suggest that such a release was unlikely?

A. Well, he didn't see many fibers. And what he saw was a mixture of fibrous materials, the majority of which, in my opinion, were chrysotile fibers.

Q. And that's a conclusion that you have reached after reviewing the Fullam photomicrographs?

A. That's correct, yes.

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Q. And were there -- you mentioned earlier that there were diffraction patterns included in those photomicrographs?

A. Yes.

Q. What type of asbestos -- what type of asbestos

fibers were depicted in those diffraction patterns?
A. They were typically chrysotile diffraction patterns.
Q. And is it your understanding, Dr. Pooley, that it was crocidolite asbestos that was used in the Kent filter material, not chrysotile?
A. I'm of that belief, yes.
Q. Was the -- let me rephrase my question.
Based on the information available to us about the Fullam Laboratory and their work, is there any way to exclude the possibility that the material observed in the Fullam Laboratory was either background or asbestos or mineral fibers not from the cigarette filters?
A. In my opinion, because of the variety of different fibrous materials, I would suggest that it was most likely contamination from the chemicals that he used in his sampling experiments.
Q. And is -- "contamination" sounds like a strong word.
Is there a certain amount of contamination that

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occurs in laboratories even today?
A. Oh, yes. The -- everybody who works with asbestos is aware of contamination problems. Especially contamination of chemicals that are used in preparation of electron microscope specimens where the objective is to study asbestos fibers.
Q. Now, have you also reviewed some material prepared by an organization known as the Armour Research Foundation?
A. Yes, I have.
Q. And what if anything does that information provide you in the way -- or let me rephrase my question.
How does that information bear upon the question of whether people who smoked Kent cigarettes could have been exposed to respirable asbestos fibers?
A. Well, the objective of the Armour Research investigations, which used electron microscopy, was in fact to study the characteristics and components of the smoke from a range of cigarettes.
And in the report that I read, there was no indication of the detection of any inorganic or fibrous particulates in their studies.
Q. Dr. Pooley, we've heard some testimony and taken some evidence in this case that describes electron microscopy. We have also heard some testimony about light microscopy.

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Is there any way to compare the results of a light microscopy study with an electron microscopy study?
A. Yes. In fact, it's a laboratory experiment that I conduct for my students here in Cardiff.
Q. And what is it that you -- or how is it that you can compare the sensitivity of a light microscope to that of an electron microscope?
A. Just by preparing a sample of asbestos on a filter and examining the filter with an optical microscope, then examining the filter with an electron microscope and comparing the difference in the counts of particles obtained per unit area of the filter.
Q. And have conversion factors been developed to help researchers and microscopists predict what they might see under a light microscope given what they are seeing under an electron microscope, and vice versa?

A. Yes. I'm sure that most of the laboratories that utilize electron microscopes in the field of asbestos research have conversion factors which they have obtained from examination of asbestos specimens.
Q. And what is a reasonable conversion factor?
MR. HARLEY: Objection. Lacks foundation as to the conversion factor for this case.
MR. OHLEMEYER: I'm not sure I understand.
MR. HARLEY: Well, he's not said that you can have
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a universal. He's said it's lab-specific.
MR. OHLEMEYER: Q. Is there a range, Dr. Pooley -- given that there is a variation from lab to lab, is there a range that one might expect to encounter in comparing light microscope results to electron microscope results?
A. I'm sorry, I think we had a little glitch in transmission there. Can you hear me?
MR. HARLEY: We've got a frozen picture.
THE WITNESS: Can you hear me?
MR. OHLEMEYER: Q. Yes. But for some reason, the picture is frozen in your end.
A. I think we've got an electrical storm in the vicinity. I'll get a technician.
Q. It's getting better, Doctor. I think it's -- it's clearing up.
A. Is it?
Q. Yes. It's clearing up. Lightning flash.
A. Could you repeat that question, please?
Q. Let me rephrase it.
Is there a range of conversion factors that one would use in converting data derived from an electron microscope specimen as opposed to a light or optical microscope specimen?
A. Yes. But the factors depend upon the type of
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asbestos that you're looking at.
Q. Let's talk about crocidolite asbestos specifically, then.
A. Well, crocidolite asbestos forms fibers which are very fine diameter. And so if you were to look at a specimen of crocidolite dust, then with a light microscope -- or let me put it another way -- with an electron microscope, you would normally observe approximately 30 times more fibers than you would if you examined the specimen with an optical microscope.
Q. Okay. And by optical, is that synonymous with light microscope?
A. Yes.
Q. Now, Doctor, let me ask you a few more questions about Dr. Longo's experiment. Specifically, his second experiment.
Assume for the sake of argument, Doctor, that -- let me back up and ask you another question.
With respect to the conversion factors that you just talked about, could you describe for us what the range would be for chrysotile and amosite asbestos?
A. With chrysotile, because it forms very, very fine fibers, you could have a difference in the number of particles counted by EM as opposed to light microscopy of maybe a hundred or more.
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With amosite asbestos, the conversion factor would

probably be somewhere in the region of about 20. Because they form thicker fibers.

So amosite fibers are more readily observed by light microscopy, followed by crocidolite, followed by chrysotile.

Q. With respect now to Dr. Longo's second experiment, the one that used three cigarettes in the smoking machine -- and I realize that even though that experiment used a smoking machine, as opposed to the syringe experiment, you still have some criticisms about the method and manner in which it was conducted.

But let's assume for the sake of argument that Dr. Longo had a reliable and representative sample; that he had a properly designed and properly executed protocol; and that he counted fibers, single fibers, as opposed to structures in generating his data.

Given the data that Dr. Longo has generated from that experiment, is there any way that you could compare that in terms of the level of asbestos in the smoke to establish regulatory standards in order to make a qualitative comparison about the --

A. Yes.

Q. -- potential exposure levels?

A. Yes. One can make a -- could you repeat that,

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please?

Q. Yes. How would you do that?

A. Well, in Dr. Longo's second report, I think he has a -- he has a table of results where he specifies the number of structures that he observed and expresses them as numbers of structures per cc of smoke.

He also -- we know from the experiment that the cigarettes were smoked over a period of time, and that approximately eight puffs were taken to smoke each cigarette.

So we know the concentration of particles in the smoke, the structures; we know how many structures would then be released from smoking a single cigarette in that machine. And we would then be able to calculate if we wanted to the number of structures that would be released from a whole packet, if necessary.

We also know that if we were to try and compare it with some occupational exposure standards, we know that we had to compare the exposure of an individual to the dust over an 8-hour period.

So if we know the total number of structures to which an individual is exposed, and we know the volume of air that an individual would inhale over an 8-hour period, we would then be able to work out how many structures per unit volume of air over an 8-hour period somebody would be

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exposed to.

Q. And could you make that -- and that essentially is a mathematical calculation?

A. Yes.

Q. Could you make that -- given the data that Dr. Longo has generated, you could make that calculation for both number of structures and/or number of structures greater than 5 microns. Is that right?

A. Yes. Yes.

Q. Because he's made a distinction in his report along those lines?

A. Well, yes. He actually talks about a

time-weighted average value of something like 21 structures per cc.

But of course, in his report, he is only referring to the smoke. He's not referring to the volume of air that an individual would inhale over an 8-hour period. And all standards are calculated on the total volume of air that an individual would be exposed to over an 8-hour period -- or inhale over an 8-hour period, sorry.

Q. And what is that volume? Is there a number or a range?

A. Oh, yes. Roughly, it would be in the order of 10 million cc's over an 8-hour period.

Q. When you take Dr. Longo's data, Dr. Pooley, and

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you make that calculation, do you come up -- I take it you end up with a number that represents structures per cc?

A. Yes. One could arrive at a number, yes.

Q. And when you do that calculation and arrive at a number, what if anything can you tell us about how that number compares to the background level of asbestos or the range of background asbestos one would expect to encounter in North America?

MR. HARLEY: Objection. Lacks foundation. You can't compare something he hasn't testified to.

MR. OHLEMEYER: Q. Let me rephrase the question, Doctor.

When you make those calculations with Dr. Longo's numbers, what kind of numbers do you turn up with in terms of a fiber-per-cc or a structure-per-cc exposure over the 8-hour period?

MR. HARLEY: Objection. Lacks foundation; failure to produce a report. And also, I don't know what numbers he's talking about. I don't know which experiment, which set of lab experiments, nothing.

MR. OHLEMEYER: Q. Well, let me ask you a hypothetical question, Dr. Pooley.

Let's assume that Dr. Longo's second experiment generated on average 16 1/2 structures per cc of smoke.

A. Yes.

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Q. Okay. If you took 16 1/2 structures per cc of the smoke and multiplied it by 280, which as Dr. Longo suggests is the total volume in cc's of smoke from a single cigarette, would that give you the number of structures you would expect to observe per cigarette?

A. That's correct, yes.

Q. If I multiplied that by 20, then would that give you the number of structures you would expect to observe from smoking a pack of cigarettes?

A. That's correct, yes.

Q. And then if I wanted to calculate a time-weighted average that I could express in terms of structures or fibers per cc for the exposure, would I divide that by 10 million cc's?

A. Yes. That 10 million would assume that you smoked the packet of 20 over a -- 20 cigarettes over an 8-hour period, yes.

Q. Well, what number -- what would you use -- how would that number change if it took you longer than 8 hours to smoke a pack of cigarettes?

A. You would have to divide the number by 30 million cc's. That would be the amount of air that you would inhale in a day.

Q. If I wanted to make an apples-to-apples comparison, though, to a regulatory standard, I'd have to

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use the volume that one breathes in 8 hours. Is that right?
A. That's correct, yes.
Q. Does Dr. Longo's experiment, Professor, provide any evidence -- his second experiment, provide any evidence to suggest that these cigarettes, as tested in his experiment, released above-background levels of asbestos into the smoke?
A. I'm sorry, I didn't quite catch your question there.
Q. Okay. Does Dr. Longo's second experiment, using the smoking machine, provide or suggest that the cigarettes used in that experiment released above-background levels of asbestos structures into the smoke?
A. Not if calculated over that time-weighted average period, no.
Q. Professor, that's all the questions I have. Mr. Harley has some questions for you, and I'm going to change seats with him.
A. Do you mind if I have just a short break?
Q. Very good. Whenever you're ready.
A. A short break?
MR. OHLEMEYER: Absolutely.
(Recess from 3:11 p.m. to 3:15 p.m.)
MR. OHLEMEYER: Q. Dr. Pooley, before Mr. Harley asks you -- I'm going to ask you a couple more questions

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before Mr. Harley starts.
A. Certainly.
Q. You're familiar with the -- are you familiar with the threshold limit values adopted by the ACGIH for exposure to asbestos?
A. In California?
Q. In the United States?
A. The United States. I believe it's .2 fibers.
Q. Well, I think -- we misunderstood each other.
In general, generally, Doctor, are you familiar with the threshold limit values that have been adopted by the ACGIH in the United States since 1946?
A. Not since 1946, no.
Q. I guess what I'm asking is not whether you know each specific one, but in general terms, are you aware of the fact that there have been threshold limit values adopted for exposure to asbestos in this country for some time?
A. Yes. They used to be -- they used to be expressed in rather strange units. For example, millions of particles per cubic foot, I believe. Yes, I am aware of that.
Q. And are those threshold limit values established based on examination of air samples through a light or optical microscope?
A. Yes.
Q. And are the current regulatory standards that

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define the level of exposure to asbestos, the allowable levels of exposure to asbestos, using -- do they use light or optical microscopes?
A. Light microscopes, yes.
Q. So if I wanted to -- if you wanted to take a time-weighted average that you derived using electron microscopy and compare it to a regulatory standard or a threshold limit value that was based on light microscopy,

would you have to use a conversion factor as we've discussed previously?
MR. HARLEY: Objection. Beyond the scope of his designation, beyond his expertise, and lacks foundation.
MR. OHLEMEYER: Q. You can answer the question.
A. Yes, you would have -- if you wanted to compare or if you wanted to predict what you would see with a light microscope after having obtained an electron microscope result, you would have to divide by the conversion factors we were talking about earlier.
So for example, with crocidolite, you would divide your number by a factor of 30.
Q. Doctor, those are all the --
A. Which will give you a very much smaller -- a very much smaller number.
MR. OHLEMEYER: Thank you, Dr. Pooley. Those are all the questions I have for you.

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EXAMINATION BY MR. HARLEY

MR. HARLEY: Q. Good evening, Doctor.
A. Good evening.
Q. This is Phil Harley.
A. How are you, sir?
Q. Pretty good, thank you.
Dr. Pooley, I want to pick up a little bit talking about what you were just discussing, or related to it.
You are familiar with something called a time-weighted average, which is a level of asbestos exposure averaged over an 8-hour day. Isn't that correct?
A. Yes.
Q. There are also regulations and standards related to peak exposure limits. Isn't that correct?
A. Yes.
Q. Those standards are that you're not to exceed that concentration of asbestos in the air at any point in the day. Isn't that correct?
A. I believe so, yes.
Q. And what is that standard for asbestos now?
A. In the United States, I'm not sure.
Q. What is it in the United Kingdom?
A. Well, they don't have a short-term exposure limit which is a particular peak value. They have what are called

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10-minute values, that the value should not be exceeded for a period of 10 minutes.
Q. And what is that value?
A. And it's of the order of 5 fibers per ml, I believe.
Q. 5 fibers per cc or ml?
A. ML, yes. It's that sort of order of magnitude, yes.
Q. And Doctor, if you went into a room with 16.5 fibers of crocidolite per cc, you'd wear a respirator, wouldn't you?
MR. OHLEMEYER: Objection.
THE WITNESS: Well, I'd have to know they were there. I mean, obviously, it's like saying if the room's on fire, you're not going to walk in there.
MR. HARLEY: Q. Right. But if you knew they were there, you'd wear breathing protection, wouldn't you?
A. If there was any pathogenic material airborne, yes, I'd wear a respirator, yes.

Q. And you'd want to know whether that fiber was in the air before somebody would let you walk in the room, wouldn't you?
MR. McELANEY: Objection.
THE WITNESS: I'd like to have that information, yes, obviously.

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MR. HARLEY: Q. Doctor, there's no doubt that air contaminated with 16.5 fibers of cc -- fibers per cc of crocidolite would be considered above any known standard today, wouldn't it?
A. Well, no. It's -- if you think of .2 fibers per ml, and you -- and that's an optical standard, based upon a light microscope -- and you were to then multiply that .2 fibers by a factor of 30, because a light microscope can't -- you can't see all the fibers in a light microscope, then you would come up with a value of 6 fibers per ml.
And so what we're saying is that the standards themselves, although they may specify .2 fibers, are really specifying 6 fibers per ml concentration.
Q. Doctor, are you aware of any standard promulgated by EPA, United States Occupational Safety and Health Administration, or the Environmental Protection Administration which recommends multiplying your fiber counts from electron microscopy by a factor of 30?
A. No.
Q. Doctor, you reviewed the Armour Research Foundation materials related to Kent cigarettes?
A. Yes.
Q. And that's entitled "The Physical Properties of Cigarette Smoke"?
A. I believe so, yes.

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Q. Can you tell me where in that report they looked for mineral content?
A. Well, they were examining smoke generated and particles in the smoke. And if there had been any mineral particles generated, then obviously they would have commented upon them.
Q. They did not say there were no mineral particles generated, did they?
A. No. They didn't observe it.
Q. What they did say is, using the impinger method of calculating particles, they found in Kent cigarettes 400 million particles per cubic centimeter. Isn't that correct?
MR. OHLEMEYER: Objection.
THE WITNESS: Of smoke, yes.
MR. HARLEY: Q. Well, that -- they said particles, didn't they?
A. Well, smoke particles, yes.
Q. And Doctor, were you provided any of the correspondence between the Fullam Laboratories and the Kent -- or Lorillard, Mr. Parmele at Lorillard?
A. Yes, I did see some of those letters, yes.
Q. Can you tell me -- you reviewed the patents of the Kent cigarettes. Isn't that correct?
A. I think the patents really referred to the manufacturer of the filter, not the manufacturer of the

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cigarette, I believe.
Q. Okay. What minerals were contained in the Kent filter other than asbestos?
A. Oh, I haven't got the patent in front of me. My

memory isn't that good, I'm afraid, to list the sort of contents of the filter.
Q. I don't mean to get oversimplistic, but is cotton a mineral?
A. No.
Q. It doesn't contain any minerals, does it?
A. No, not that I'm aware of, no.
Q. And is cellulose a mineral?
A. No.
Q. Is acetate a mineral?
A. Not that I'm aware of.
Q. Okay. So Doctor, when Mr. Parmele is asking Dr. Fullam to test cigarettes to confirm the release of mineral fibers, is he talking about asbestos, in your opinion?
MR. OHLEMEYER: Objection.
MR. McELANEY: Objection.
THE WITNESS: I have no idea.
MR. HARLEY: Q. What did you understand the purpose of the Fullam Laboratory testing to be?
A. To investigate the release of fibrous particles.

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Q. In particular, mineral fibers. Isn't that correct?
A. That might have been in the letter. I can't remember the letter.
Q. And do you recall Dr. Parmele referring to Althera Revere's experiments?
A. Vaguely, yes.
Q. Do you recall whether Dr. Parmele characterized Althera Revere's experiments as indicating there was a mineral fiber release from Kent filters?
MR. OHLEMEYER: Objection.
THE WITNESS: Again, I haven't got the letter in front of me, so it would be -- I'm just dredging my memory. But I think there was some reference in the letters to Dr. Fullam, a reference to Ms. Revere's experiments, yes.
MR. HARLEY: Q. Do you have any reason to believe or any knowledge whatsoever that Althera Revere's laboratory was contaminated or her results were contaminated?
MR. OHLEMEYER: Objection.
THE WITNESS: No, I have no information or no indication that that was the case, no.
MR. HARLEY: Q. Doctor, you indicated in reviewing the photomicrographs of the testing conducted at the Fullam Laboratories, you found evidence of other minerals being identified in the electromicrographs. Is that correct?

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A. Let's put it this way: My sort of opinion after looking at those micrographs and the diffraction patterns were that the fibers -- the fibrous particles recorded in those micrographs were mineral particles, yes.
Q. And now, what I want to know is, the ones that you identified as being chrysotile, which photomicrographs, or which cigarette test lot, were those associated with?
A. I had no way of linking the micrographs to the variety of cigarettes that were tested.
Q. You understand that the Fullam Laboratories tested six different versions of cigarettes. Is that correct?
MR. McELANEY: Objection.
THE WITNESS: I believe there were a number of formulations, yes.
MR. HARLEY: Q. You do not know whether the

minerals that you saw on the photomicrographs came from the regular Kent test, do you?
MR. McELANEY: Objection.
MR. OHLEMEYER: Objection.
THE WITNESS: No.
MR. HARLEY: Q. And you don't know whether the chrysotile asbestos you observed on the photomicrographs came from the regular Kent test, do you?
MR. McELANEY: Objection.
MR. OHLEMEYER: Objection.

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THE WITNESS: No, I don't.
MR. HARLEY: Q. Doctor, I want to talk -- or ask you some questions about Dr. Longo's tests.
You recall reviewing Dr. Longo's tests before he conducted the cigarette test -- smoking machine test, don't you?
A. Yes, I do.
Q. And do you recall testifying prior to that that if he used a smoking machine, much of your criticism of his tests would go away?
A. Yes, I made that statement, yes.
Q. Doctor, have you ever conducted any smoking machine tests on old Kent cigarettes?
A. No, I haven't, no.
Q. Have you asked Lorillard or Hollingsworth & Vose for permission to do that?
MR. OHLEMEYER: Objection.
THE WITNESS: No, I haven't.
MR. HARLEY: Q. Could you design a test for determining whether old Kents released fibers from the filter during normal smoking?
MR. McELANEY: Objection.
THE WITNESS: Yes, I think we could probably make a good attempt at it, yes.
MR. HARLEY: Q. And you've told -- you've

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testified in response to pretty much that same question in the past with the same answer, haven't you?
MR. OHLEMEYER: Objection.
THE WITNESS: Sorry?
MR. HARLEY: Q. Do you recall last year when you testified that -- you were asked the same question by Mr. Brayton, and gave pretty much the same answer, that you've told Lorillard and Hollingsworth & Vose that you're capable of designing a valid test?
MR. McELANEY: Objection.
MR. OHLEMEYER: Objection.
THE WITNESS: I can't remember providing an answer like that. But anyway, we would be capable of doing it, yes.
MR. HARLEY: Just give me one moment here.
Q. Doctor, I'm going to you ask you if you recall during your testimony of January 24, 1994, if you testified in the following manner:
"Question:" -- Page 2905, line 8 through line 13 -- "And you have indicated that you thought tests could be designed which would provide useful information; is that correct?
"Answer: I am sure if you -- yes, if you design them correctly, you could obtain useful information."
Do you recall giving that testimony in 1994?
A. Yes. I think it's -- but it's written down there,

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so yes, I do believe that, yes.
Q. Okay. And despite -- between January of 1994 and July of 1995, have you undertaken any tests or designed any tests to see if Kent cigarettes release asbestos fiber -- old Kents -- during their smoking?
A. No, I haven't, no.
Q. Doctor, have you ruled out the possibility that old Kents released respirable-size asbestos fibers during their smoking in the 1950s? Have you ruled out that possibility?
A. No, I haven't, no.
Q. Doctor, there were some questions asked you by Mr. Ohlemeyer concerning fiber bundles, fiber aggregates and fiber structures.
Do you recall that?
A. (Witness nods head.)
Q. You have to answer yes.
A. Yes.
Q. And -- I mean, you couldn't just nod your head. You didn't have to answer yes.
Doctor, what is your definition of a fiber structure?
MR. McELANEY: Objection.
THE WITNESS: Well, the same that I gave to Mr. Ohlemeyer. That it's a particle with a 3-to-1 actual ratio.

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MR. McELANEY: Objection.
THE WITNESS: That's the definition we utilize for research and counting purposes.
MR. HARLEY: Q. All right. And is that the same definition that the EPA uses in setting its counting standards?
MR. McELANEY: Objection. Phil, didn't you use an impermissible phrase, "fiber structure"?
MR. HARLEY: Structures.
MR. McELANEY: But you have to ask the question either "fiber" or "structure," and you said a "fiber structure."
MR. HARLEY: Q. Doctor, I don't mean to misspeak. I'm trying to be precise here.
The term "structure" in counting asbestos fibers using electron microscopy has -- is a term of art. It has a meaning unique to that situation. Is that fair to say?
A. Yes. It indicates that the -- you have groups of fibers which are not individual, basically.
Q. And Doctor, is it fair to say that if you had three individual fibers who have fallen on top of each other and formed a triangle, you would call -- that would be properly defined under EPA counting guidelines as a single structure?
A. Yes.

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Q. Even though it's composed of three clearly identified single fibers?
MR. OHLEMEYER: Objection.
THE WITNESS: Yes.
MR. HARLEY: Q. You mentioned an article by Drs. Churg and Warnock concerning background levels of asbestos in the air. Do you recall that?
A. Yes.
Q. Drs. Churg and Warnock were formerly associated with the University of California at San Francisco Medical School. Is that correct?

A. Yes.
Q. And the article they published is a group of autopsies from people in which they did asbestos burden analyses for that group of people. Is that correct?
A. Yes.
Q. And this is not an air sampling type of analysis; this is from lung tissue?
A. That's correct, yes.
Q. And some of those people in that study they identified -- first of all, they identified the occupations of the subjects. Is that correct?
A. I believe the article does contain that sort of information, yes.
Q. And some of the occupations identified are clearly

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occupations in which you would expect asbestos exposure, including shipyard work. Isn't that correct?
A. I haven't got the article in front of me, so I really can't say "yes" or "no" to that question.
The only thing I can say with regard to occupation of the individuals they examined was that they selected the tissues such that they had extremely low asbestos body counts. And they used that as a way of indicating that the individuals had not been occupationally exposed to asbestos.
Q. Since that time, a wide variety of American pathologists and researchers have done similar investigations. Is that correct?
A. Yes, I believe that there are a number of people involved in this field now, yes.
Q. Including Dr. Roggli and Dr. Dodson?
A. Yes, Dr. Roggli in North Carolina --
Q. Yes. Dr. Dodson, University of Texas?
A. Texas. And there's Gerald Abraham in Syracuse, yes.
Q. Right. Now, Doctor, in addition to that method of finding out what background is, there have been literally hundreds of published reports of samples taken from the air in the United States, haven't there?
A. Oh, yes. Yes.
Q. And are you familiar with an American

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government-sponsored group called AHERA, A-H-E-R-A, American Health Effects Research Association -- Asbestos Health Effects --
A. I think they're based in Boston, aren't they? At Harvard University. I think they are, yes.
Q. And Doctor, they've done -- they've published articles comparing background samples of air taken throughout the United States, haven't they?
A. Yes.
Q. In their air sampling techniques, how often have they ever found crocidolite in the ambient air of the United States?
A. I have no idea.
Q. Is it less than one in a thousand?
MR. McELANEY: Objection.
THE WITNESS: I have no idea.
MR. HARLEY: Q. There is a difference between the amount of crocidolite that you would expect to find in the United States versus where you live in the United Kingdom; is that correct? Great Britain.
A. Yes. I believe we used more crocidolite in this country, yes.

Q. And you've done a considerable body of research on the health effects of crocidolite. Is that correct?
A. That's correct, yes.

Q. And you have opinions on whether the various fiber types are capable of causing mesothelioma, don't you?
A. Yes.
Q. What is your opinion about the ability of chrysotile acting alone to cause mesothelioma?
A. In my opinion, there isn't any information in the literature to indicate that chrysotile alone would be the cause, or the causative agent, as far as mesothelioma goes.
Q. And what's your opinion as to the ability of crocidolite to cause mesothelioma?
A. Oh, I think there's considerable information to show that it is a causative agent.
Q. You believe crocidolite is the primary cause of mesothelioma, don't you?
MR. McELANEY: Objection.
THE WITNESS: Yes.
MR. HARLEY: Q. I believe you have described crocidolite as the, quote, "premier culprit," end quote, in mesothelioma causation. Is that correct?
A. Yes. I believe so, yes.
Q. And Dr. Pooley, the -- in recent testimony, weren't you asked if you would smoke old Kent cigarettes with an asbestos filter?
MR. OHLEMEYER: Objection.
THE WITNESS: Yes, I was asked.

MR. HARLEY: Q. And didn't you say you would not, because you thought they were -- you wouldn't even pick one up?
MR. McELANEY: Objection.
MR. OHLEMEYER: Objection.
THE WITNESS: Yes.
MR. HARLEY: No further questions.
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FURTHER EXAMINATION BY MR. OHLEMEYER
MR. OHLEMEYER: Q. Dr. Pooley, I just have a few questions.
The issue of fiber type -- now, wait a second.
Dr. Pooley, Mr. Harley asked you a question about smoking a cigarette with a crocidolite filter today.
A. Yes.
Q. And you don't recall ever saying that you would never pick one up, do you?
A. No. I think -- when I was asked the question previously, I think it referred to smoking it.
Q. Your testimony is not that you would not pick up a cigarette with a crocidolite filter, is it?
A. Oh, no. No. I'd pick one up, yes. But I wouldn't smoke it. I wouldn't smoke it, because I consider that smoking tobacco is far more injurious to your health than inhaling crocidolite.

Q. The issue of fiber type and whether certain types of asbestos fibers are more likely than other types to cause disease, that is an issue that other researchers have looked at and come to different conclusions than yours. Isn't that right?
A. Oh, yes.
Q. And the idea -- or let me rephrase my question.

If one were to do or to try to design a test to try to determine whether cigarettes manufactured and sold in the 1950s released respirable asbestos fibers, one would -- would such a test require a representative and reliable sample?

A. Oh, of course.

Q. You would need cigarettes in the same or substantially similar condition to those that were manufactured and sold at the -- during the relevant time period?

A. Of course.

Q. The regulatory standards that were discussed, are those based on an 8-hour time-weighted average?

A. I'm not sure which ones you're referring to.

Q. Mr. Harley asked you about some regulatory standards. OSHA, EPA.

Are those 8-hour time-weighted averages?

A. Well, there are various standards. There is an

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8-hour time-weighted average, but there are also short-term exposure levels and maximum exposure levels.

Q. So for example, if you wanted to compare the 16-fiber-per-cc number described by Dr. Longo with a regulatory standard, you would have to first convert it to a time-weighted average in the manner you described before?

A. Well, if you had the ability to measure short-term exposures, then you could, as I said, predict what the short-term exposure might be and then utilize that if necessary.

But it would have to be averaged over time.

Q. And --

A. In Great Britain, we average it over a 10-minute period.

Q. But on this side, we do it on an 8-hour period?

A. Well, the -- your TV -- I think you call it TVL?

Q. TLV.

A. TLV. TLV, sorry. We call it occupational exposure standard here.

But yes, your TLV is based upon an 8-hour time-weighted average, yes.

Q. Now, finally, Doctor, as a general proposition, I think you would agree that anything is possible, would you not?

A. Yes. Yes.

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Q. But based upon your background and your experience and the information available to you, is it your opinion that it is more likely than not that these cigarettes would not have released respirable asbestos fibers when they were smoked during the 1950s?

A. There is no indication so far in the information that I have seen that respirable fibers have been released or would have been released from those, no.

MR. OHLEMEYER: Thank you very much, Dr. Pooley. That's all I have.

MR. HARLEY: Just a couple --

MR. OHLEMEYER: Mr. Harley as a few for you.

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FURTHER EXAMINATION BY MR. HARLEY

MR. HARLEY: Q. Dr. Pooley, I'll be brief. I know it's getting late over there.

Dr. Pooley, back to the issue of picking up, you are of the opinion that merely picking up and handling the

Kent -- old Kent cigarette, without smoking it, but just handling it with your hands, causes fibers to come out of the filter. Isn't it correct?

MR. McELANEY: Objection.

THE WITNESS: Oh, I have no idea.

MR. HARLEY: Q. Well, isn't that why you criticized Dr. Longo's work, is that you said by him

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handling the filter, handling the cigarettes, he caused fiber release?

MR. McELANEY: Objection. Mischaracterizes the testimony.

THE WITNESS: Yes. Well, he was manipulating the filter in order to insert it into a pre-drilled hole. And -- but picking up a -- picking up a cigarette and holding it in your hand, I doubt if that's going to cause any release of material.

MR. HARLEY: Q. But holding the filter and rolling it between your fingers and manipulating it the way a smoker might do, is that going to cause a release?

MR. McELANEY: Objection.

THE WITNESS: I would -- yes, possibly, yes.

MR. HARLEY: No further questions.

MR. OHLEMEYER: That's all we have, Doctor. Thank you very much for staying up late with us. I appreciate it.

THE WITNESS: I'll sing the National Anthem now

MR. OHLEMEYER: Thank you very much, Doctor.

(Time noted, 3:50 p.m.)

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Signature of the Witness